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Brazilian National Science and Technology Week: a case study on engagement behaviors and impacts on the public

Wilmo Ernesto Francisco Junior

Abstract

This practice insight describes a case study in which structured observation and questionnaires (for visitors and presenters) were combined to investigate a public science event during Brazilian National Science and Technology Week (NSTW) in 2019. A very large proportion of participants (68.6% of visitors and 25 of the 31 presenters) had been unaware of the NSTW. Among those visitors who showed initial engagement, more than half progressed towards more effective engagement behaviors. The relaxed atmosphere favored the public's participation. Activities in generic locations in less favored areas are relevant to reach out to a diverse audience. Further research is recommended for critical assessment of similar events.

Keywords

Informal learning; Popularization of science and technology; Public engagement with science and technology

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Introduction

Brazil's National Science and Technology Week (NSTW) is an initiative instituted by presidential decree in 2004 with the purpose of raising the awareness and interest on science and technology. NSTW has been held annually based on a central theme from which actions are organized. Since its first edition, the number of participants, activities, sites and diversity of spaces involved has grown significantly. In the first edition, 1,840 activities involving 250 registered institutions were carried out in 252 municipalities. The 16th edition, in 2019, conducted 101,576 activities in 1,101 municipalities performed by 521 institutions (https://semanact.mcti.gov.br/snct2019/).

The promotion of science in unconventional spaces is one proposal for engagement of a diverse audience [Bultitude, McDonald & Custead, 2011; Bultitude & Sardo, 2012; Boyette & Ramsey, 2019]. These generic locations differ from informal spaces such as science museums, since visitors do not normally expect to find science there [Sardo & Grand, 2016]. Science exhibitions in generic venues might elicit

feelings of surprise and novelty, while simultaneously aim to broaden attendance [Bultitude & Sardo, 2012; Boyette & Ramsey, 2019]. Another challenge arising is assessing the impact of the contributions and whether they attract a diverse public.

Aiming to achieve a better understanding of science events in generic venues, particularly for the NSTW in Brazil, this survey was organized based on the following research questions: i) What are the magnitude, type of public and main reasons that attract visitors to an event about science in an informal public space? ii) What kind of impacts and public engagement can be fostered during the activities? The objectives outlined were: i) to investigate the visitors' profile ($n = 261$), their engagement behaviors ($n = 310 \pm 13$), and the perceived impacts resulting from participation in the activities; ii) to evaluate the perceptions of the presenters ($n = 31$) about the impacts on the visitors and on themselves.

Public science events in generic venues

Public science events can be considered cultural events that value democratic rights to leisure, education, and culture from the combination of enjoyment and science communication activities [Bultitude & Sardo, 2012]. There is evidence that providing opportunities for science-related activities in unusual contexts leads to potentially positive results regarding the future attitudes of participants [McCallie et al., 2009]. Bell, Lewenstein, Shouse and Feder [2009] argue that the public impacts of science communication activities in informal spaces can be different from impacts in formal spaces, such as contributions to people's investigative capacity, pleasure, and feeling that science learning can be personally relevant and gratifying. The authors divide the contributions of these spaces into six main areas: interest in science; understanding of scientific knowledge; scientific reasoning; reflection about science (nature of science); engagement in scientific practices; and identification with the scientific enterprise (fascination for studies in the area).

However, there are the need and the difficulty of establishing indicators and assessments in this process [Bell et al., 2009; Jensen & Buckley, 2014]. Such events, which are usually attended by a varied public, are characterized by quick turnover and a relatively short visitation period, making accurate measurements difficult. Even so, evaluating and investigating the benefits of public science events helps to build quality parameters and improvements to be pursued. Therefore, this practice insight describes an approach to evaluating the impacts of activities carried out in generic environments combining different data sources in the context of the largest science communication event in Brazil.

Methodology

The context

The public science event investigated here was part of 16th edition of the NSTW 2019 whose central theme was Bioeconomy. The activity consisted of a scientific exhibition addressing the socio-cultural and economic importance of the region's biomes (mangrove swamps and caatinga), with emphasis on environmental aspects interrelated with physics, chemistry and biology. The two days of the exhibition were attended by approximately 1,600 people and was held in the shopping center located in the municipality of Arapiraca, state of Alagoas, northeastern Brazil, a medium-sized city (population of about 220,000). The

exhibition took place on a weekend (Saturday and Sunday) and was the first of this kind since the mall's opening in 2014.

The exhibition was set up in a hall (approximately 6 m wide × 12 m long) and all the stands were arranged in such a way as to form a route that the public could visit at its discretion. There was no suggested order for visitation, which did not affect the main theme. The event was not widely publicized. Thus, the people who visited the mall did not expect to participate in an activity of this nature.

The exhibition was carried out through hands-on activities, consisting of 10 stands with interactive experiments. Alagoas is a coastal state in which seafood fishing and milk production are important economic activities. Hands-on activities included simple and well-known experiments that used materials representative of the region: tests of electrical conductivity in different samples (milk, water sea and drinkable water); iron identification in milk; effect of detergent in molecular interactions (color-changing milk with food coloring); pH tests of soil and water from different locals (semi-arid, coast, mangrove swamps); production of natural dyes (solubilization of pigments in water and alcohol) from sand samples of Alagoas; coloring drawing of plants and animals typical from caatinga region and mangrove swamps; decomposition of sea shells by using acid solutions; water sea distillation; tests of density: float or sink (solids in different solutions); erosion with and without mangrove areas. Environmental aspects, like water contamination, predatory fishing of crabs, effects of mangrove deforestation, caatinga biodiversity, illegal sand mining were discussed orally the during the experiments. Complementary information was provided from printed materials (posters and pamphlets).

All the activities were mediated by presenters (all university students, 18 female and 13 male, age ranged from 18 to 26) who were available at each stand to explain to visitors how to perform the experiments, interacting verbally to discuss the results. All the presenters had previously participated in a short training program (8 hours) on how to mediate interactive scientific activities.

Type of research and data collection

This practice insight describes a case study research, which is concerned with issues such as distinctiveness, uniqueness and the complexity of social situations [Gillham, 2010]. The investigation combined different sources of data that allowed the information to be triangulated, thereby increasing its reliability and validity.

The first source of data was provided by the structured field observation technique which was conducted for a total of three hours on one day of the exhibition and divided into 3 segments (one hour each): early afternoon, midafternoon, and early evening (the busier times to reach a varied audience). The observation was guided by the proposal of Barriault and Pearson [2010], and considered behavior variables during the exhibition, such as: type of reaction when faced with the exhibition, dialogues and interaction with the experiments and presenters, and length of stay at the exhibition. The characteristic of each behavior is based on the visitor's actions as summarized in Table 1.

Table 1. Types of behavior according to visitor actions.

Behavior	*Type of actions*
None	Passing by
Initiation behaviors	
Doing the activity	Stopping to look Stopping to interact
Spending time	Looking at how the exhibit works, or someone doing the activity; Watching the exhibit or person interacting with the exhibit with explicit interest in the activity (facial expression or verbal); Interested in activity outcomes; visitor approaches the activity after observing it.
Transition behaviors	
Repeating the activity	Interacting with one or more experiments Enjoyment of outcome
Expressing positive emotional response	Smiling, pleased with exhibition Stronger signs of enjoyment such as laughter; verbal references to enjoyment Obvious signs of eagerness to participate; excitement
Breakthrough behaviors	
Engaged	Engages in conversations with explainers and other visitors about the various outcomes; Asks questions; Duration of interaction: significant (more than 15 minutes)

Adapted from Barriault and Pearson [2010].

The information was obtained independently by two researchers for subsequent comparison. The observers kept a discreet distance from the visitors to take notes about the public's reactions without disturbing the latter, while enabling them to listen to the conversations. Fifteen random people agreed to wear a stopwatch during their visit to evaluate the visitors' length of stay and interaction with the exhibition. The field observation data were combined with information provided by the visitors themselves. For this, a questionnaire was drawn up containing 11 items to help the researchers characterize the profile of the public, who, in turn, self-evaluated their experience and their perceived benefits of the exhibition.

The first four questions referred to the participants' profile based on their sociodemographic data (gender, age, education, place of residence). The second block consisted of a question, on a scale of intensity, regarding the participant's interest in science and two open questions ("I (don't) believe in science, because…"/"Have you ever attended NSTW or other public science events?"). The last block of questions concerned the visitors' opinions and perceived benefits of the visit. This block comprised four questions, two on a scale of intensity ("Participating in the exhibition was a satisfying experience"/"I would like to participate in activities like this one again"), and two open questions ("Participating in this exhibition contributes to…"/"Indicate the main reason that made you stop and participate in the exhibition"). Visitors were asked to answer the questionnaire immediately after leaving the area of the exhibition. The questionnaires were completed by hand by 261 visitors.

1. Had you ever participated in science communication activities before? Were you familiar with the NSTW?
2. Scientific exhibitions such as the one held during the NSTW are beneficial to my education.
   ( ) I strongly disagree ( ) I disagree ( ) I'm not sure ( ) I agree ( ) I strongly agree
3. What impacts did you perceive in your education process? Describe aspects that you consider positive and/or negative.
4. Scientific exhibitions such as the one held during the NSTW are beneficial to the visiting public.
   ( ) I strongly disagree ( ) I disagree ( ) I'm not sure ( ) I agree ( ) I strongly agree
5. What impacts of the NSTW did you perceive for the visiting public? Describe aspects that you consider positive and/or negative.
6. How would you describe your interaction with the public?
7. In your opinion, and considering what you experienced during the activity, what reason or reasons caused the visitor to stop in order to participate and interact with the activities?

Figure 1. Questionnaire answered by the presenters.

Lastly, information was also garnered from the point of view of the presenters (Figure 1), who worked for at least one 3-hour shift, interacting directly with the public ($n = 31$). The purpose of this survey, which was answered by presenters about three weeks after the event, was to determine previous participation in public science events, and to find out their impressions about both the visiting public and the event for themselves.

Approval to participate in the evaluation was granted by all research participants (visitors and presenters) who were informed about the purposes of the evaluation, the research activities, how participants' identity would be protected, and other ethical aspects of this evaluation research. The volunteer presenters filled out a term of free agreement and received a copy of it, which included detailed information about the evaluation research and the conditions associated with their agreement to participate.

Data analysis

From the observational data, the behavioral indicators were quantified and then compared by the two researchers to ascertain their degree of intercoder agreement, which varied from 79.3% (transition behaviors) to 93.7% (no engagement), suggesting good reliability. A statistical analysis of the survey data was then performed by calculating the mean, percentage and deviation from the mean of each type of engagement. These data were used to create a visitor engagement profile (percentage of visitors versus types of engagement), which underpinned a descriptive analysis.

The answers to the open-ended questions on the survey were subjected to a qualitative content analysis. Initially, all the answers were read in their entirety to identify and classify them according to similarity in a *posteriori* categories. The categories were applied deductively to refine and (re)adjust the data and then quantified to determine their representativeness within the data set. Lastly,

descriptions from the open-ended responses that represented each category were selected to illustrate key results in section below. The data from the Likert scale answers from the presenter survey were analyzed using calculations of frequency and means, with a score ranging from 1 (I strongly disagree) to 5 (I strongly agree).

Results

Field observations

The field observations revealed plenty of visitors (approximately 310 ± 13 people during the 3 hours of observation over the two days), probably because the event was held on a weekend. The busiest times were early afternoon (1pm–3pm — 200 visitors approximately) and early evening (6pm–7pm — 100 visitors approximately). Field records based on the instrument (Table 1) were used to build the profile of public engagement behaviors (Figure 2).

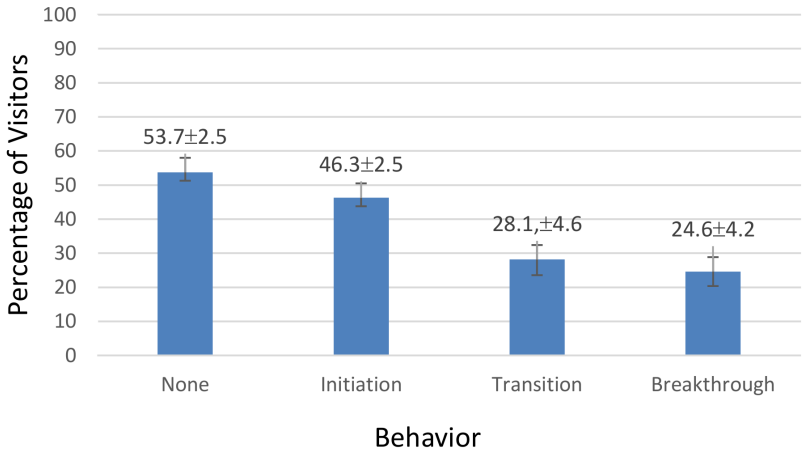

Figure 2. Profile of visitor engagement behaviors.

Most of the visitors (53.7%) went through the exhibition without demonstrating any kind of reaction (no engagement). However, a significant proportion (46.3%) displayed an initial engagement behavior. The main reactions were facial expressions, body language or verbal exclamations. Most of these people examined the experiments, read the printed materials and talked with each other. Among the public that displayed an initial interaction, 28.1% went on to more in-depth interactions. All these people demonstrated positive emotional reactions (smiling, joyful, euphoric, pleased) that lasted practically the whole time, characterizing a transition behavior. Most of the people who engaged in more in-depth interactions were not limited to a single experiment, interacting with two or more experiments.

The progress towards transition behaviors resulted in a high percentage of breakthrough behavior (24.6%). If one considers only the public that stopped to participate in the exhibition, 87.5% demonstrated characteristics of highly engaged behavior. Verbal interactions and gestures among the participants themselves were constant, characterized not only by responses to stimulate but by questions and comments. Fifteen visitors were evaluated in terms of length of stay. Although the data cannot be accurately extended to the entire population of visitors, the average length of stay of most of them was 30 to 40 minutes, varying from 6 minutes to 1 h 23 min. The results from the observation of verbal interaction associated with length of stay are strong indications of breakthrough behaviors.

Visitors

The survey data gathered from participants ($n = 261$) indicated diversity among the visitors in terms of age and educational level. The age ranged from 8 to 67 years (average of 25 years). More women than men visited the exhibition, i.e., 58% vs. 42%, a slightly higher difference than in the Brazilian population (48,9% of men and 51,1% of women). As for the educational level, most of the visitors had completed high school (29.4%). Basic Education students (11.8% Elementary School and 9.8% High School) also represented a significant percentage at 21.6%. In addition, a significant number had completed higher education (15.7%) or were engaged in it (15.7%). About 10% revealed some education at the postgraduate level, but did not clarify their level, except for 1.3%, who stated a doctoral degree. Most of the visitors were residents of Arapiraca, although a significant number also lived in neighboring municipalities.

With regard to previous interest in science, the average of the evaluations (3.65) showed a moderate agreement. Twenty-four percent of the visitors stated they were already familiar with the NSTW. As for the visitors' attitudes toward science, there were more positive reactions ($n = 125$) than negative ones ($n = 8$), in line with the preceding question about previous interest. Positive responses to the open-ended questions on the participant survey were divided into three major groups, while negative responses comprised two categories (see Table 2).

Table 2. Visitor's attitudes towards science.

Types of responses	*Categories*	*Examples of responses*	*Number*	*Total*
Positive	Social development and well-being	"...this is what enables us to realize how important it is to preserve and value nature, through scientific studies."	82	
	Worldview	"...it explains daily phenomena and provides us with insight into some of our everyday activities."	36	
	Critical reasoning	"...it helps us to develop as humans capable of questioning"	07	125
Negative	Disbelief in cultural factors	"In part, because some theories are not quite what I believe."	03	
	Disbelief in other factors	"What they say is not always true."	05	08

Overall satisfaction with the exhibition was quite high, presenting the average score of 4.8 on the Likert scale. The level of satisfaction was confirmed by the answers to the open question about the benefits of the exhibition for visitors (Participating in this exhibition contributes to...). Table 3 describes the classified and quantified responses.

Most of the responses were generic, often associated with access to new information and the experiments performed. Some comments alluded to specific scientific concepts concerning the need for action to preserve and protect the planet, demonstrating new reflections about the subjects of the exhibition.

The main reasons for participating in the exhibition pointed out by visitors were the element of surprise, interest in science/new knowledge and fun (Table 4).

Table 3. Impacts of the exhibition identified in visitors' responses.

Categories of responses (types of impacts)	*Samples of responses*	*Total*
General	"Understand how things happen and that in most cases there's an explanation."	103
Actions/attitudes	"How harmful pollution is to the planet (experiment with seashells), and precautions to take with certain products (...)."	65
Interest	"It made me more inclined to research and learn more." "I had no idea science could be fun."	48
Specific knowledge	"Burning fossil fuels increases the acidity of the oceans." "Learning about electric current and current density and what is polar and nonpolar."	23

Table 4. Main reasons for participating in the exhibition.

Categories of responses	*Samples of responses*	*Total*
Element of surprise	"I saw the posters and the people in that outfit and it made me curious." "I saw that there were many different things and I love learning new things."	97
Interest in science/new knowledge	"Science helps us understand everything that is happening on our planet and shows us solutions to problems." "I was interested in the experiments; we don't have many lab opportunities in my school."	63
Fun	"I saw a lot of people, which I found cool." "Science can be fun, and that attracted me."	63

The vast majority agree completely (60%) or agree (38%) in participating in similar activities again (4.5 on the Likert scale). These results highlight a good public acceptance.

Presenters

The first question addressed to presenters sought to identify their previous experience with science communication activities. Of the 31 participants who answered the questionnaire, 25 stated they had never experienced activities of this nature and 30 of them had never heard of the National Week of Science and Technology. They described impacts experienced during their formative years (average on the Likert scale was 5.0), basically pertaining to scientific knowledge, teaching aspects and social issues (see Table 5).

About the beneficial effects on the visiting public, the presenters offered the highest level of agreement (average score of 5.0). All of them mentioned positive effects and the only negative aspect was lack of interest/indifference during exhibition (Table 6).

Three central aspects attracted visitors according to the presenters: element of surprise ($n = 19$); interest in science or new knowledge ($n = 8$) and; exhibition setup ($n = 4$). The presenters' comments were similar to those of the visitors, suggesting that the public's engagement may actually be associated with different

Table 5. Impacts on the presenters (in their own opinion).

Types of responses	*Categories*	*Examples of responses*	*Number*	*Total*
Positive	Scientific knowledge	"I have learned about chemistry, how to conduct experiments and several techniques."	16	
	Teaching knowledge	"About the investigative method. How to stimulate people, ask questions and interact with people."	09	
	Social issues	"There is great personal growth beyond academic purposes. We can see the role of the university in social development, including our own. Most of us have never participated in events like this one."	06	31
Negative	Lack of commitment	"Some people don't study as much as they should before making a presentation."		02

Table 6. Impacts on the visitors, in the opinion of the presenters.

Types of responses	*Categories*	*Examples of responses*	*Number*	*Total*
Positive	Attitudes about knowledge	"Sow some doubts in them. If visitors were interested in what was being exhibited, they could do further research on the subject later and increase their knowledge, and possibly change their worldview in some way."	16	
	Scientific concepts and information	"Offering the visitors knowledge about specific topics about the themes addressed [in the exhibition], thus generating a lot of curiosity, and also providing them with information."	13	
	Socio-scientific issues	"People started to think and reflect about the topics after watching the experiments."	02	31
Negative	Lack of interest/ indifference	"Dismissiveness demonstrated by visitors. It's difficult to talk when people have in mind a negative stereotype about science (in my case, Chemistry), and come to see "fire" but fail to pay attention (or show interest) in the discussion."		03

factors, including the pleasant climate, participation and interactions among visitors and with presenters, as well as interest in science and new knowledge.

In describing their interactions with the public, the presenters pointed out three characteristics. The predominant one was participatory interaction ($n = 21$), in which visitors talked with and shared their experiences (characteristic of breakthrough behavior). To a much lesser extent, a few visitors ($n = 6$) showed a more introspective behavior, limiting themselves to observing or showing interest in the exhibition without interacting verbally. Comments that characterized a less intense interaction were the most rarely recorded ($n = 4$). Such attitudes are consistent with the engagement profile based on field observations, which indicates interaction as a factor that leads to the transition or breakthrough behaviors.

Discussion

The findings from this evaluation of a two-day informal science communication event, held in a shopping mall (a generic space) during Brazil's NSTW, revealed that a diversity of visitors, representing a broad range of ages and levels of education participated in the event. However, most of the young people were in their final phase of secondary education, with a predominance of women. These findings are positive in terms of fostering the involvement of young people and women in science. Most of the visitors (76%) and the presenters themselves (25) had never participated in public science events and were not familiar with the NSTW, indicating a paucity of opportunities for interaction with science outside the school environment. Such results corroborate that science events in generic spaces frequented for leisure can have advantages in reaching a diverse public and eliciting more significant changes in people's perceptions about science [Bultitude & Sardo, 2012; Canovan, 2019]. Although the social status of people who have access to shopping malls should be considered, the state of Alagoas is among those with the lowest educational and social indices in the country. The location of the mall in a city in the interior of northeastern Brazil also favors a public deprived of other similar events, as indicated by the data about participation in previous science events.

Particularly for NSTW in Brazil, the few studies that have characterized these events indicate that they are held predominantly at traditional institutions (museums or universities) and that they are attended mostly by student audiences [Garroti, 2014; Rothberg, Fiani & de Sousa, 2016]. Thus, the development of events in the region and outside classical science institutions contributes to help Brazilian NSTW face numerous challenges, chiefly the capillarity of the national territory and the combination of different types of activities in less favored communities [Sampson Pinto, 2014]. In addition, the data point out that attending science events is also important for the group of presenters. All the students who participated had a lower socioeconomic status than the average Brazilian one, and most of them (29) were the first in their families to obtain higher education. The results of this evaluation hold potential for those looking for alternatives to science festivals, whose audiences are composed mostly of economically privileged groups, with a high level of education and access to science [Kennedy, Jensen & Verbeke, 2018; Ribeiro et al., 2019; Ocobock & Hawley, 2020].

In terms of the engagement profile, the data revealed that just over half of the public paid no attention to the exhibition. However, among the public that showed initial levels of engagement (46.3%), more than half (61.0%) also demonstrated a transition behavior, indicating pleasure and satisfaction. An important inference is that the progress towards transition behaviors resulted in a high rate of breakthrough behavior (87.5% of those who demonstrated an intermediate engagement behavior). The presenters' perceptions about their own interactions with the public aligned with the engagement profiles of the visitors developed by the researchers through the observations and participant survey findings. The engaged portion of the public who answered the questionnaire indicated high satisfaction (average rating of 4.8), and also strong high interest in participating in this kind of activity again. While visitor engagement was not investigated separately for each booth contents, observers noticed age differences for coloring activities using natural dyes, which attracted more children than older people. The other experiments appeared to attract similar kinds of visitors in terms of engagement.

Public events may offer opportunities for positive emotional reactions, pleasure and novelties, and these feelings are general linked to the level of satisfaction [Jensen & Buckley, 2014; Grand & Sardo, 2017]. Bultitude and Sardo [2012] identified three main elements which contribute to that: the informality of the environment, the involvement of scientists with the public, and the opportunity to involve participants in the discussion of scientific concepts in a more relaxed way. Another important variable is the element of surprise, caused by a scientific exhibition in an unconventional location, which was one of the most noticeable reactions. The organization of events in these spaces can therefore attract new and more diverse publics. Streicher, Unterleitner and Schulze [2014] state that common access, trust in those responsible for the event, and respect for visitors' time and knowledge are characteristics that contribute to their good receptivity and potential beneficial effects. Habibi Doroh and Streicher [2021] expand these ideas, stating that such spaces promote accessibility, public participation and interaction between everyone involved (visitors, presenters, exhibition) in order to encourage experiences of cooperative learning in a pleasant atmosphere.

As for their prior interest in science, 58.6% of the visitors agreed or strongly agreed with the statement. This finding is similar to those reported in studies conducted in other contexts of informal science activities [Sardo & Grand, 2016; Adhikari et al., 2019]. Since the questionnaire was answered only by the part of the public that interacted with the exhibition, it can be inferred that there is a positive relationship between prior interest and engagement. Thus, engagement data compared to visitor satisfaction and the desire to participate in similar events again are another indication that events in unusual leisure spaces may engage the public by maintaining or strengthening their interest in science.

With regard to the reasons for attending the exhibition, the results from the observers, the findings from the perceptions of presenters, and findings from surveys of the public itself converge towards some key points: surprise at encountering science in an unusual space; a relaxed atmosphere promoted by interactions and public movement; previous interest in science; and curiosity about the experiments. Such elements seem to favor the public's aforementioned participation and engagement. Several studies on this theme have reported similar findings. Investigating the national science week of Thailand, Chen [2014] reveals that the main reason for attending is interest in learning something new. Adhikari et al. [2019] point out that approximately half the visitors emphasized learning about something new, and linked entertainment with leisure. Other studies also described curiosity, fun and pleasure as positive factors mentioned by the public [Bultitude & Sardo, 2012; Fogg-Rogers, Bay, Burgess & Purdy, 2015; Sardo & Grand, 2016].

As for the event's impacts on visitors, their responses revealed aspects about actions/attitudes, interest in science (desire to delve into the themes and learn new lessons) and acquisition of specific knowledge (concepts). This finding is in agreement with the opinions of the presenters, who also observed these attitudes and reflections about everyday themes based on knowledge, the desire for new knowledge and the understanding of specific subjects among visitors. These findings fit into three of the six aspects proposed by Bell et al. [2009] for learning in informal spaces: interest in science; understanding of scientific knowledge; and scientific reasoning.

Learning in informal settings is influenced by a set of factors that include exhibition content, design, display, and manipulations of the objects; conversations with curatorial teams, as well as visitors' motivations and intentions/identity [Leinhardt & Knutson, 2004]. Such aspects indicate parameters that can also be considered in the planning of public science events and assessments about their impacts on visitors.

Final remarks

This practice insight captures knowledge about the public, as well as knowledge about the benefits of informal science activities and types of engagement behavior. To this end, the evaluation combined different research instruments. As a limitation, one can assume that any self-assessment questionnaire offers only a personal view. Field observation also has some limitations insofar as garnering information is concerned, particularly verbal interactions and a more rigorous quantification of behaviors. The triangulation between observers, visitor data and presenters' perceptions favored reliability and could improve the quality of further similar investigations.

Although this is the most important public science event in Brazil, a very large proportion of participants (68.6% of visitors and 25 of the 31 presenters) had been unaware of the NSTW. This reveals not only the relevance of this action for science communication but also underscores the need to think about other ways to promote greater public engagement with science. A significant portion that demonstrated an initial engagement also went on to show breakthrough behaviors.

Among the visiting public that answered the questionnaire, 56% pointed out high interest in the theme. Therefore, the event contributed to attracting and engaging not only an audience previously interested in science but also one not specifically interested in it. Characteristics such as the pleasant atmosphere of a location, which was already frequented by the public, encouragement to participate and respect for visitors have been identified as relevant factors for the success of public science events [Bultitude & Sardo, 2012; Sardo & Grand, 2016]. Nevertheless, the duration of engagement and the activities offered should be extended to reach more people.

NWST in Brazil has mostly valued activities performed with student audiences at classical institutional venues [Rothberg et al., 2016]. In this regard, broadening the audience in a more representative way implies organizing events at varied venues, particularly in less economically privileged locations [Bultitude, 2014; Griffiths & Keith, 2021]. Carrying out activities in generic locations, especially in cities in the interior of the country, can produce significant effects on the diversity of the public in attendance. Moreover, the engagement of presenters who have had scant opportunities to attend public science events in the planning and execution of exhibitions fosters their educational process, and can result in future commitments for involvement in science related activities. Brazilian NWST has been little investigated; hence, it is highly recommended that further research be conducted for critical assessments and improvements as a public policy.

Lastly, some recommendations for planning and running these types of events can be summarized from this experience: a) prioritize visitor diversity through early discussion in the planning stage about how to perform explanations considering age, educational and sociocultural backgrounds (this can aid to clarify ideas and to

avoid incorrect learning); b) provide further information to visitors by using printed/online materials (visitors can continue to learn); c) include less favored areas to reach out to a diverse audience; d) create a harmonious exhibition setup (activities planned thematically) to help visitors associate issues and to build up a better overview of the topics; e) adopt a challenging approach of science content (experiments and verbal interactions to foster science thinking).

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Author

Wilmo Ernesto Francisco Junior is professor of science education at the Federal University of Alagoas in Brazil. He earnead a Ph.D. degree in chemistry education from the Institute of Chemistry at São Paulo State University (UNESP/Brazil). His main research interests lie in public communication of science and pedagogical practices intertwining art and science.

 wilmojr@gmail.com

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